MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

ETN3056 – COMMUNICATIONS NETWORKS
(TE)

26 OCTOBER 2018
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTION TO STUDENT

1. This Question paper consists of 5 pages (including this cover page) with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the Answer Booklet provided.

Question 1 (25 marks)

(a) The following questions is related to circuit-switched network.

(i) Explain why does circuit-switched network needs a dedicated path.

[2 Marks]

(ii) Which multiplexing is best used for circuit-switched: frequency division multiplexing (FDM) or time division multiplexing (TDM)? Discuss your answer.

[2 Marks]

(iii) List three (3) advantages of circuit switching compares to packet switching.

[3 Marks]

(b) Given that a single crossbar switching that supports 49 incoming users and 49 outgoing users.

(i) Is it a blocking or non-blocking system? Explain your answer.

[2 Marks]

(ii) Calculate the numbers of crosspoints and availability.

[2 Marks]

(iii) Design a similar non-blocking system using three-level multistages crossbar switching (draw and label all devices). Given that the first stage crossbars is using 7 inputs.

[8 Marks]

(iv) Calculate the numbers of crosspoint and availability in b(iiii).

[4 Marks]

(v) Compare the crosspoints result in b(iv) with a single stage switch in b(ii). Is there any cross points reduction as expected? If not, explain why.

[2 Marks]

Question 2 (25 marks)

(a) Identify and explain the system below either half-duplex, full-duplex, multicasting or broadcasting.

(i) Television channel that trasnmit terrestrially.

[1 Mark]

(i) Long Term Evolution (LTE) system that communicate using voice service between two end users.

[1 Mark]

Continued .....

(i) Malaysia police arm force using walkie-talkie to communicate between their officers.
[1 Mark]

(i) Video streaming that only send to the paid customer.
[1 Mark]

(b)

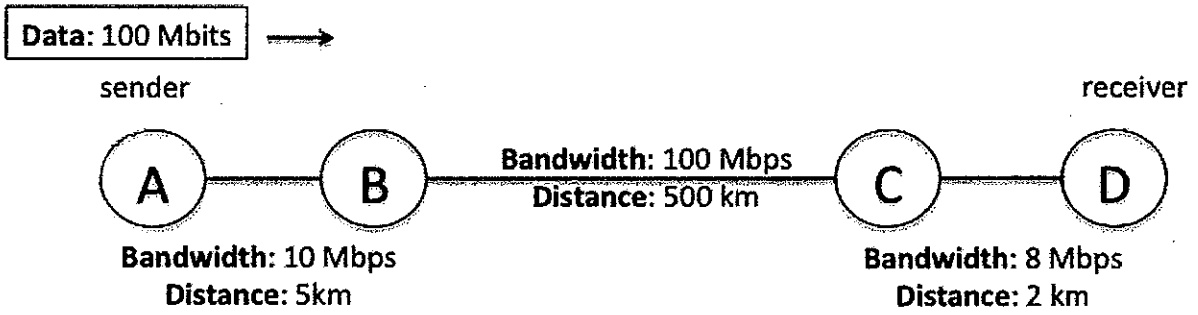

Figure Q2(b)

Given the network links as in **Figure Q2(b),** answer the following questions given that the speed of the transfer is 3×10^8 m/s. Also assume that the processing and queueing delay can be neglected.

(i) Find the total propagation delay.
[4 Marks]

(ii) Find the total transmission delay.
[4 Marks]

(iii) Find the end-to-end latency.
[2 Marks]

(iv) What is Round Trip Time (RTT)? Hence, what is the value of RTT for this system?
[2 Marks]

(iv) How many bits can be transmited before the first bit reaches the other end of the channel?
[3 Marks]

(c) The following questions are related to packet swiching system.

(i) Discuss how switch is better than hub and bridge.
[3 Marks]

(ii) Discuss how layer 3 switch is better than software-based router.
[3 Marks]

Continued .....

Question 3 (25 marks)

(a) A pure Aloha network transmit 200-bit frames on a shared channel of 200kbps.

(i) Calculate the average frame transmission time.

[1 Mark]

(ii) Identify the vulnerable time to avoid data collision.

[2 Marks]

(iii) Calculate the throughput if given that $Smax = G \times e^{-2G}$ and the station produce 500 frames per second.

[2 Marks]

(iv) How does slotted Aloha help improves the throughput from pure Aloha?

[3 Marks]

(b) The following questions are related to Wireless Fidelity (WiFi).

(i) Discuss three (3) disadvantages of deploying WiFi as compared to wired connection.

[3 Marks]

(ii) Draw, list and describe all components that involved in WiFi infrastructure network.

[4 Marks]

(iii) How does Multiple Input Multiple Output (MIMO) antenna helps to achive higher data rate in IEEE 802.11n?

[3 Marks]

(c) The following questions are related to Internet of Things (IoT).

(i) Name two (2) other similar names with IoT. Explain why they are similar.

[3 Marks]

(ii) For home automation IoT system, which one is better connectivity to connect multiple sensors: Bluetooth or WiFi. Explain your answer.

[4 Marks]

Continued .....

Question 4 (25 marks)

(a) Briefly explain the differences between all four (4) cellular network generations coming from the first generation until fourth generation. What are the key features for each generation.

[8 Marks]

(b) Design a cellular system given that the frequency spectrum allocated ranging between 900-950MHz and 1830-1880MHz. The system uses frequency division multiplexing (FDM) with 3.8 kHz of voice channel each. It also support 8 user for each subband of 200kHz. Explain how the system can combined frequency division duplexing FDD/FDMA/TDMA in its deployment. Useful diagram can help in your explanation.

[6 Marks]

(c) Why handover and roaming are important services in cellular network. Describe each service separately.

[4 Marks]

(d)

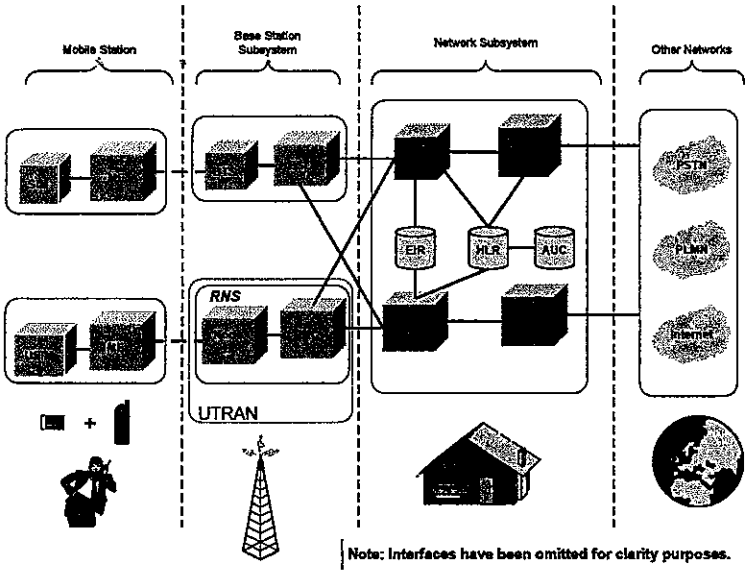

Figure Q4(c)

Figure Q4(c) show the architecture of a second generation (2G) and third generation (3G) network.

(i) What is the function of SIM and USIM?

[3 Marks]

(ii) Which component handle Radio Resource Control (RNC) in 3G network? Name also another function that contol by this component.

[2 Marks]

(ii) Which component handle the handover process in 2G network? Name also another function that control by the same unit.

[2 Marks]

End of Paper